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TOPOREAL: Topography of the North Atlantic realm

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Tectonics and erosion are the driving forces in topography evolution, but resolving their relative contributions remains a fundamental scientific problem in relation to the understanding of geodynamic and surface processes in the presence of a changing climate.

In the N Atlantic realm the most recent major active margin and collision tectonism (save for the intraplate Cenozoic Eurekan orogen) dates back to the early Palaeozoic ($\sim$0.5Gy) closure of the Iapetus Ocean and Caledonide collision between Baltica and Laurentia. Earlier events comprise the Sveconorwegian orogeny at $\sim$ 1Gy affecting SW Scandinavia, and a range of Palaeoproterozoic ($\sim$1.8Gy) orogenic events involving the North Atlantic Craton and Archaean cratonic blocks of E Canada and Greenland. Presently, the remains of these orogens in several locations have high, low-relief topography, and although topography can be of ancient origin, this has attracted much interest because it could be the sign of Cenozoic uplift of low-relief landscapes previously graded to sea level.

However, contrary to common beliefs, we hypothesise (Nielsen et al., 2009) that the low-relief high elevation landscapes here are generally the consequence of the glacial buzzsaw and periglacial processes acting on ancestral topography of Caledonian or older age. Flexural isostasy related e.g. to Quaternary fjord formation e.g. in the E and W Greenland magmatic provinces, as well as rifting and magmatism are also important. We take an interdisciplinary approach using complementary methods from geophysics, seismic stratigraphy, geomorphology, numerical modelling and thermochronology.

We conclude that the role of climate change, erosional processes and isostasy in the understanding of the evolution of N Atlantic continental margins and adjacent sedimentary basins have been underestimated in the past. Making allowance for landform generating surface processes significantly simplify geological models of the region and significantly change the understanding of continental margin evolution in the N Atlantic realm, thereby contributing to elucidating the tectonics-climate and plume/asthenosphere-lithosphere schisms in this important area. For the oil industry a simpler and understandable geological evolution translates directly into reduced exploration risk.

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